

ACOFS - The Australian Council of Film Societies

Film Society Handbook

Chapter 3: TECHNICAL ASPECTS - FILM

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Traditionally, films used by most film societies were 16mm gauge. This refers to the width of the actual film. The 16mm film has sprocket holes on one edge and the sound track on the other. Silent 16mm films occasionally have sprocket holes on both edges. Commercial cinemas, and some film societies, use 35mm film with sprocket holes on both edges and the sound track located on one side of the film image.

The “standard” or Academy image on the film (16mm and 35mm) has a width-to-height ratio of 1.33:1 (ie 4:3, same as television). Some filmmakers use a 'widescreen' ratio of 1.66:1 (or 1.85:1) by masking the height of the 16mm or 35mm image.

An even wider image is obtained by the "CinemaScope" ('Scope) process. This basically consists of photographing the film through an anamorphic lens which reduces the horizontal width of the image without changing the vertical dimension. Thus a much wider image is squeezed onto the "standard" ratio. If this film were now screened using the normal projection equipment the image would be of the same size as a normal "standard" film but the actors would appear very thin. To screen the film correctly you require a 'Scope (anamorphic) lens placed in front of the normal lens. This will stretch the picture back to its original size giving an effective width-to-height ratio of 2.35:1. Presto, you have Cinemascope — but don't forget to allow for a larger screen. It needs to be about 77% wider than the normal screen unless you zoom out to make the whole picture smaller to fit the screen width.

Originally, 35mm 'Scope films had an aspect ratio of 2.66:1 and a magnetic soundtrack, but to accommodate an additional optical soundtrack 35mm 'Scope was narrowed slightly to a ratio of 2.35:1. Unfortunately the 16mm 'Scope standard remains at 1.66:1 which means that a small amount of the 35mm frame is lost from the top and bottom of the frame when transferring to 16mm. This is not nearly as bad as transferring a 35mm 'Scope film to a 16mm standard screen Academy ratio print.

Most films shot in 'Scope end up as standard prints when transferred to 16mm for hire or showing on TV. To do this, almost half the picture area is omitted from the sides. Alternatively, the 16mm print may be “panned & scanned” which means while still in standard ratio the image seen is centred on the person talking. If that person is on the right hand side of the 'Scope image, after transfer, you see the person, but not the left hand side of the original image. This can be just as disconcerting.

Thus if you have a choice of standard and 'Scope versions of a film you should opt for the 'Scope print if you're serious about the film. However, make sure you have access to an anamorphic lens.

Another option is the "Letterbox" image, which reduces the size of the "widescreen" image until it fits into the film without the need for an anamorphic lens. There will be a black bar at the top and bottom of the screen, hence the descriptive name.

Projectors

The projectors you use will determine the quality of the image your members will see. In this section we'll discuss some of the facts you need to know to help you choose the correct projection system for your location. But first, you're wondering where to get a projector? You should investigate the possibility of borrowing or buying equipment rather than spending money on rentals. Many schools, colleges and universities have historically owned 16mm equipment and so have some community and church organisations, as well as your regional library. Some state film Federations may give you an interest-free loan to purchase a projector, if your society has enough for a deposit. Many educational and business organisations no longer use 16mm film and have sold their projectors. This has created a market for relatively cheap projectors and many societies are now readily able to afford to buy a projector. Check out Ebay and specialist suppliers for possibilities.

Projector Lamps: These have to produce a brilliant, white, even light from a very compact filament which must be positioned in a glass envelope with great precision so that it lines-up perfectly with the optical system of the projector. The light intensity of the projector lamp will determine the maximum distance a projector can be used from the screen. As you move further back the image will become increasingly darker.

Later projectors use 250 watt quartz-iodide lamps. These projectors can be used up to 20 metres from the screen. For distances up to 25 metres, a projector which utilises a Marc 300 or Gemini arc lamp should be utilised, but these projectors and the lamps are more expensive because a special transformer is used. For larger auditoria, or a much brighter light, a projector using a Xenon arc lamp is required. This is more expensive again.

Remember that a significant factor affecting the brightness of the image is its size. A projector operating further away may produce a brighter image if the image is zoomed smaller.

Whatever lamps you use, always keep at least two spares for one projector, or three spares for two projectors. One might be a dud.

Lenses: Apart from the type of lamp you use, there is another factor which determines the distance of the projector from the screen. This is the focal length of the lens you use. The focal length determines the spread of the projected image with distance and therefore the screen width required for a given projection distance.

For a 2 inch lens the screen-width is 19% of the "throw" (distance from screen to projector). Conversely the projection distance equals 5.20 times the width of the image on the screen. The relationships for the lenses with shorter and longer focal lengths are shown in the following table:

Focal Length of lens	"Throw" expressed in width of screen image
1 ½ inch (38 mm)	3.98 x width
2 inch (50 mm)	5.20 x width
2 ½ inch (63 mm)	6.47 x width
3 inch (75 mm)	7.77 x width

So, if your screen size and projection-distance is fixed and the picture does not fit the screen neatly using the standard 2 inch (50mm) lens, then you can solve the problem by changing the focal length of the lens. Alternatively, you may use a "zoom" lens which either fits in front of your existing lens or replaces it entirely.

For those of you who would like to work in metric the formula given below can be used to calculate throw.

$$\text{Throw (m)} = \frac{\text{Focal length (mm)} \times \text{width (m)}}{9.65}$$

Another lens already mentioned is the anamorphic lens used for 'Scope screenings. This lens must be fitted very precisely in front of the existing lens on your projector, either attached to a special adaptor ring attached to the projector, or alternatively screw on directly to the existing lens of the projector. If you have an anamorphic lens that doesn't fit and you can't find a suitable replacement, then you can still solve the problem by borrowing a retort stand and clamps from your local high school science laboratory. However this method of holding the lens in place involves considerable fiddling well before the screening to get the picture "just right" (and don't bump the lens once you've set it up).

Exciter Lamps: The exciter lamp provides the light for scanning the soundtrack of the film. If it fails, the sound goes dead. Keep spares, as for projector lamps. Note that some projectors don't use exciter lamps — the light for the sound track may be taken directly from the main projector lamp through a special optical system. Occasionally some films have a magnetic soundtrack, these require a special projector for screening.

Projectors in pairs : If possible you should use two projectors. This eliminates breaks between reels. An average feature film on 16mm takes 2-3 reels so that you would have 1-2 breaks during the film if you used only one projector.

To help projectionists determine when the reel is about to finish, films usually (but not always) have cue marks. The first one appears about 7 seconds before the end of the reel, the second one appears one second from the end. These marks are usually small dots (or sometimes crosses or rough blobs) which appear on the top right hand corner of the screen for a fraction of a second. Look for them carefully. Many 16mm prints are taken directly from the 35mm prints - including the cue marks. As 35mm reels are much shorter you may see cue marks 2 or 3 times during a 16mm reel, this gets confusing when they appear near but not at the 7 second mark.

For a truly professional changeover arrange for the second reel to be threaded, pre-focussed, with the lamp on and the sound level adjusted, with the number 7 on

the leader arranged to be in the gate. This means that there are 7 seconds of leader tape left before the film starts. When the first cue mark appears at the end of reel 1, switch on the motor of projector 2. When the second cue mark appears immediately switch over the sound and image from the first projector to the second. You can purchase changeover switching devices for some projectors to make the job easier. Usually the projector lamp requires some time to come up to full brilliance so should be turned on some time before the changeover. As the most likely time for a globe to fail is at turn-on, many operators prefer to turn both projector lamps on before the screening and not switch them off until the show is finished.

Film Sound

Cinemas generally employ digital sound, in Dolby and Multi-track surround sound, and you need to remember this stiff competition when designing your own sound setup.

16mm is generally restricted to analogue, mono sound, which is poorer quality than its 35mm big brother. You can improve on the old style of a single central speaker by providing 2 speakers, a good non-distorting amplifier and graphic equaliser to cater for variability between film soundtracks.

While a 16mm film can not provide the sound quality of a CD, FM radio or DVD, it is still capable of a satisfactory performance. However, there are adverse factors which can affect the quality of reproduction and reduce the intelligibility of the sound. These include, less than optimum recording and printing of the film, difficult acoustics of the room where the film is shown, the condition of the projector, a mistake in loading the film and the type of loudspeaker(s) used. Ideally the tone should be left at their level settings but if intelligibility is poor, it may be necessary to boost treble and cut bass.

The level (volume) of the soundtrack can vary quite considerably on some prints and the volume control should be adjusted to compensate as they occur. In general it is as important not to have the volume too high nor too low. Increased volume does not necessarily increase audibility.

Another important aspect is the positioning of the speakers. They should be placed above the audience so that the sound travels in a straight line to everybody in the audience. They are best placed at on either side of the screen (if two) as high as practicable and pointing down. If the speakers are too low the higher frequencies will be absorbed by the people in the first row, for the rest of the audience the sound will appear muffled.

Halls with many bare walls cause a lot of reverberation as the sound bounces from one wall to another. This is often a serious problem for 16mm users. Curtains and drapes are a great help — and so are people with their clothing. You can find out if you have a reverberation problem by standing in the middle of the hall and clapping your hands once, loudly and listening how quickly the sound dies away. If this appears excessive, try to aim the speakers directly as possible at the audience or at the most absorbent wall.

Print Quality

Film processing laboratories are capable of producing very high quality 16mm prints of feature films. Unfortunately, this comes at a cost and the economics of 16mm distribution often prevent the best quality prints being obtained. With older films, the original negative may be lost and the copies have to be made from a used projection print. Some of the factors affecting print quality are:

- a. Defects in printing the film itself due to lack of quality control in the laboratory.
- b. Number of generations that the current print is from the original negative or master positive. As a general rule, the older the film the greater this number, however, in the case of mainstream films print generations are also a function of the number of prints which are required for commercial release
- c. 16mm prints are often made from a negative made from a release print (especially in the case of sub-titled films) or are a reversal copy made directly from the release print. Either method involves some loss in image quality. There is also a loss in tonal quality i.e. images become washed out, very contrasty. Subtitles, particularly where they are on light backgrounds, become difficult to read. Sound quality is also reduced unless the sound track is electronically re-recorded

There is nothing that can be done to improve the quality of an unsatisfactory print. In general the smaller the size of the projected image the less obtrusive are the shortcomings in print quality. Where you are planning to screen 16mm features in a large hall or commercial cinema it is usually advisable to enquire about the print quality, and this is even more important if the films are made in the thirties and/or are silent or subtitled. You may need to persevere since the distributor may not be willing or able to give you this information.

Print Condition

Print condition is to do with the age of the print, the way it has been handled and the state of the projectors it has passed through (see film damage below). Up-to-date information on print condition is difficult to come by (the previous borrower is clearly the best source). In the case of bad scratching the distributor himself is likely to be unaware of it unless he has been advised by the borrower. It is usually only practical for breaks and sprocket damage to be checked. If you are really concerned about presentation it is advisable to check the print yourself on film winders. You would of course need access to a splicer to repair any breaks — do not use Sellotape or similar. Do not repair sprocket damage without consultation with the distributor, unless absolutely necessary to get the film through the projector. Basically, print condition is the responsibility of the supplier.

Film Damage whilst in the Projector

The film you screen is often more valuable than the projector and *you* are responsible for any damage caused. The main causes of film damage are:

1. Dirt in the projector gate. Dirt not only scratches film resulting in those nasty lines you sometimes see on the screen, but also a large amount of dirt can make it impossible to keep the film in steady focus. Clean the gate after every reel. Use a brush, never a metal object
2. Improper threading. Check that the film is threaded correctly by visually examining the film path and turning the 'inching' knob each time you thread the film.
3. Worn sprockets and claws. Can cause the image to jump. Should be checked regularly. Also the pressure plate which holds the film in position.
4. Damaged reels. If the film "catches" on the edge of the reel you may tear the film or damage the sprocket holes — It is always better to replace the reel but if you carefully bend out the section of the reel that catches you can temporarily fix the problem. Plastic reels are generally better than metal.
5. Cinching. Pulling the end of the film to tighten it while it is on the reel scratches the emulsion. This is called cinching. Don't do it.
6. Damaged sprocket holes and poor splices. These often result in further damage to the film.

Problems During Projecting

The most common problems are listed below. In most cases you'll have to stop the projector and rectify the problem as rapidly as possible. Some of these problems can be prevented by taking precautions before the film is threaded onto the projector.

Remember if the projected picture looks or sounds wrong, or if the projector is unusually noisy, stop and check. You may be damaging a film and the time to check it is IMMEDIATELY!

PROBLEMS:

Film out of focus	Check focus regularly during each reel
Dirt in the gate may make it difficult to focus	clean it
Film breaks	Usually due to a poor splice — don't repair film. Re-thread film and wind it onto takeup spool.
Fluttering image	Due to loss of loop. Most modern projectors have an automatic loop restorer but some work better than others. Your projector may also have a manual loop restorer that you can press while the projector is operating. If this doesn't work stop the film and

	re-thread correctly. If the film continues to lose the loop check for the cause — usually damaged sprocket holes, poor splices or worn claws.
"Warbling" sound	The film isn't tight around the sound drum. Stop the film and re-thread.
No image	Is power on? Is the lamp OK? — don't touch quartz-iodide lamps with your fingers; always use a cloth.
No sound	Are the speakers plugged in? Is the exciter lamp OK?

Before feeding a reel of film into a projector you must do two things:

1. Check the title and reel number on the leader tape. Don't trust the label on the can or box. It is quite common for the wrong reel to be in a box. Ensure that it has been re-wound or the image will appear upside-down.
2. Most film is damaged at the beginning of a reel rather than later. Therefore it is wise to examine the first few meters or so of the film before screening. Look for poor splices and damaged sprocket holes. Be careful when unwinding the film, do not allow it to settle on the floor where it will surely gather dust.

A Projectionist's Kit

For a smoother operation of film screenings it is a good idea to put together a "kit" in a handy box or bag. This should include the following articles and should be within easy reach of the projectionist at the screening:

torch.

sticky tape — to tape down film ends.

brushes — for cleaning gate and film path.

spare lamps (including sound lamp).

projector instruction manual.

lens tissue (not facial tissues).

log book to record running times and other problems encountered with films and equipment.

window cleaner and clean rag to clean booth window, that is if you have a projection booth.

a few basic tools like a screwdriver, pliers, tweezers, razor blade, etc.

one set of reels for each projector.

Common sizes are 400, 800, 1200, 1600, 2000 and 2200 foot reels.

Auto loading projectors

Automatic loading projectors are good when they work properly but very difficult to re-adjust the film once it is loaded. Usually the automatic mechanism requires a very specific shape of the leading edge of film, so it is advisable to use the special film clipper on the projector before loading the film.